

REMARKS/ARGUMENTS

Claims 1-47 are active in this application. Claim 1 has been amended to require the treatment of the pyrolyzed carbon foam with water vapor and/or carbon dioxide at above 400C either during or after the pyrolysis. Claims 9-10 and 16 have been amended to correct minor formal errors. These corrections are supported by the claims as originally filed. New claims 31-47 have been added, with claim 31 corresponding to the combination of original claims 1, 2, 3 and 5, and new claims 32-47 corresponding to various dependent claims from claims 6 to 26. No new matter has been added by these amendments.

The present invention relates to a method for the preparation of a foam, comprising at least 70% by weight of carbon (a carbon aerogel). The method of the present invention requires pyrolysis of polymer foams having at least 30% by mass of a polymer material having nitrogen content of more than 6% by mass and a porosity of from 35% to 99.5% and an open cell content above 1%. Further, the foam is required to contain an inorganic selected from zinc chloride, calcium carbonate, ammonium polyphosphate, expanded graphite and metal powders, incorporated into the polymer foam, and/or applied to the surface. According to the embodiment of claim 1, the present method further requires that the carbon foam be treated either during or after pyrolysis with water vapor and/or carbon dioxide at a temperature above 400C. The embodiments claimed in claim 31 require that the organic foam be selected from either a urea-formaldehyde, melamine-formaldehyde or polymeric isocyanate adduct polymer foam.

The rejections of claims 9-10 and 16 under 35 U.S.C. 112 have been obviated by the present amendments.

Various combinations of claims stand rejected under 35 U.S.C. 103 over Biesmans, in combination with one or more of Wilmsen, Falkenstein, Gregg, or Pekala. None of these references disclose or suggest the present invention as claimed. As noted by the present

application, the present invention is directed to produce carbon aerogel foams having high internal surface areas, where the internal surface areas are readily accessible. In fact, of the various references recited by the Examiner, only Biesmans and Pekala make any mention of carbon aerogels. The other references only disclose various organic foams, with those not even appearing to be aerogels of the organic polymer foam! Both Biesmans and Pekala fail to disclose the present invention methods and products, as neither discloses the incorporation of inorganic fillers into the organic foam to be pyrolyzed and neither discloses the treatment of the pyrolyzed carbon foam with water vapor and/or carbon dioxide at a temperature of over 400C either **during or after** pyrolysis.

Biesmans is a study on the pyrolysis of polyurethane aerogels to obtain carbon aerogels. However, the only disclosure of treating with carbon dioxide is in the formation of the organic polymer gel at page 65 under Experimental procedure, which describes the use of supercritical CO<sub>2</sub> into the organic polymer to create the organic aerogel. This, however, is followed by removal of solvent (and thus removal of residual CO<sub>2</sub>) from the aerogel prior to pyrolysis (see last three lines prior to Section 3. Results). The description of the pyrolysis process indicates that it is performed under nitrogen atmosphere (see page 65, right hand column). Accordingly, Biesmans makes no mention of a required step of the present invention, namely the inclusion of inorganics either in or on the surface of the polymer foam or the treatment of the pyrolyzed carbon foam with water vapor and/or carbon dioxide at a temperature of over 400C either during or after pyrolysis (or both).

The only other reference to mention pyrolysis to form a carbon foam is Pekala. The description provided in Pekala regarding pyrolysis is sketchy at best! The only description is at page 4, which describes that the RF (resorcinol-formaldehyde) aerogel can be subsequently pyrolyzed at 1100C in an inert atmosphere to form vitreous carbon aerogels. However, there is absolutely nothing within this reference regarding the inclusion of either inorganics as

required in the claims, or the treatment of the pyrolyzed carbon aerogel with water vapor and/or carbon dioxide at over 400C either **during and/or after** pyrolysis.

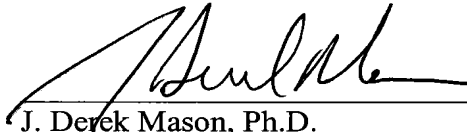
Pekala is a non-enabling reference with respect to the formation of carbon aerogels, as there is insufficient information given on how to transform an organic polymer aerogel into a carbon aerogel. Further, the only organic polymer aerogel that is mentioned as being convertible into such a carbon aerogel is the RF (resorcinol-formaldehyde) aerogel (which is not one of the embodiments required in new claim 31).

The remaining references of Falkenstein, Gregg and Wilmsen merely discuss the formation of various organic polymer gels/foams, and nowhere disclose or suggest that such gels/foams can be converted into carbon aerogels. Further, none of these references overcome the deficiencies of the Biesmans and Pekala references, as there is no disclosure or suggestion to treat a carbon foam with water vapor and/or carbon dioxide at over 400C either **during and/or after** pyrolysis! Additionally, the Examiner has taken polymer foams from these secondary references and suggested that it would be routine for the ordinary person in the art to pyrolyze them and arrive at either the present invention method or products. However, even if the Examiner was correct that it would be routine to just pyrolyze the organic polymer foams of the secondary references based upon the pyrolysis of Biesmans, such would not achieve the present method (see above comments regarding the deficiencies of the methods taught by Biesmans and/or Pekala), and would not achieve the high internal surface area carbon aerogels attained by the present invention. Accordingly, the rejections should be withdrawn.

Applicants submit that the application is now in condition for allowance and early notification of such action is earnestly solicited.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "J. Derek Mason", is written over a horizontal line.

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